(11) Japanese Patent Laid-Open No. 9-259263

(43) Laid-Open Date: October 3, 1997

(21) Application No. 8-093180

(22) Filing Date: March 22, 1996

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(54) Title of the invention:

IMAGE FORMING APPARATUS

(57) [Abstract] (amended)

[Problem to be Solved]

To provide an image forming apparatus which can prevent the productivity of the image forming from being degraded by efficiently accessing an image memory in which image data is saved in an image forming process of a digital copying machine, and the like.

[Solution]

By providing a primary storing apparatus 106 and secondary storing apparatus 107 in an image memory 66, image information and pieces of management information of the storing apparatuses are separately saved. When the storing apparatus is accessed, it becomes possible to sequentially access only the image information without accessing the management information on the storing apparatus, and the productivity of the image forming can be prevented from being degraded. By separating defective block information and normal information of the management information of the storing apparatus, an amount of access to the storing apparatus can be reduced.

[Claims for the Patent]

[Claim 1]

An image forming apparatus, characterized by comprising:

an image memory for saving digital image information; and

memory controlling means for controlling said image memory,

wherein said image memory includes:

first storing means; and

second storing means,

said memory controlling means

saves the digital image information in said first storing means,

transfers and saves management information of said first storing means in said second storing means, and

manages said first storing means by the management information saved in said second storing means.

[Claim 2]

The image forming apparatus according to claim 1, characterized in that

said memory controlling means

saves the digital image information and defect information of said first storing means of the management information of said first storing means in said first storing means, and

transfers and saves the management information of said first storing means other than the defect information in said second storing means.

[Claim 3]

The image forming apparatus according to claim 1 or 2, characterized in that

said first storing means is a non-volatile storing medium, and said second storing means is a volatile storing medium.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an image forming apparatus, particularly, to an image forming apparatus such as a digital copying machine.

[0002]

[Conventional Art]

Conventionally, an image forming function by a digital copying machine includes, for example, a copying sorting process as disclosed in Japanese Patent Laid-Open No. 62-249562. In this apparatus, image data of a document is read by a scanner, and the read image data is saved in a storing apparatus by each document. The saved image data is read from the storing apparatus according to order for providing a copy requested by an instructed of a CPU, the read image data is reproduced by a printer, and a copy is outputted.

[0003]

However, in this apparatus, when the image data in the storing apparatus is read, it is necessary to access management information and the image data on the storing apparatus, so that such a problem is induced that the storing apparatus can not be efficiently accessed, and the productivity for forming an image to be reproduced is degraded.

[0004]

[Problems to be Solved by the Invention]

An object of the present invention is to provide the image forming apparatus which can solve a conventional defect, prevent the productivity for forming an image from being degraded by efficiently accessing the storing apparatus storing image information, and efficiently manage the management information of the storing apparatus.

[0005]

[Means for Solving the Problems]

The image forming apparatus of the present invention includes an image memory saving digital image information, and memory controlling means for controlling the image memory, the image memory includes first storing means and second storing means, and the memory controlling means saves the digital image information in the first storing means, transfers management information of the first storing means to the second storing means to save the management information in the second storing means, and manages the first storing means by the management information saved in the second storing means.

[0006]

In the image forming apparatus of the present invention, the memory controlling means also saves the digital image information and defect information of the first storing means of the management information of the first storing means in the first storing means, and

transfers the management information other than the defect information of the first storing means to the second storing means to save the management information in the second storing means.

[0007]

In the image forming apparatus of the present invention, the first storing means is a non-volatile storing medium, and the second storing means is a volatile storing medium.

[0008]

[Embodiments of the Invention]

Figure 1 illustrates a rough arrangement diagram of an embodiment of an image forming apparatus according to the present invention.

[0009]

When a start key 34 of an operation unit 30 is pushed by an operator, a bundle of documents, whose image surface is in an upward direction, placed on a manuscript stage 2 installed in an automatic document feeder (ADF) 1 are carried to a prescribed position of a contact glass 6 by a carrying roller 3 and a carrying belt 4 from the lowest document to the upper one.

[0010]

Image data of the document carried on the contact glass 6 is read by a reading unit 50. The read document is ejected by the carrying belt 4 and an ejecting roller 5.

[0011]

When it is detected by a document set detector 7 that next document exists on the document stage 2, the document is carried to the contact glass 6 like the previous document, and is operated like the above. A transferring motor drives the carrying roller 3, the carrying belt 4, and the ejecting roller 5.

[0012]

Transcription paper stacked in a first tray 8, a second tray 9, and a third tray 10 is fed by a first paper feeding apparatus 11, a second paper feeding apparatus 12, and a third paper feeding apparatus 13 respectively, and is carried by a vertical carrying unit 14 up to a position contacting to a photoreceptor 15. The image data read by the reading unit 50 is written to the photoreceptor 15 by a laser from a writing unit 57, and when the image data passes through a developing unit 27, a toner image is formed.

[0013]

While the transcription paper is being carried by a carrying belt 16 at a rate which is the same as a rotation rate of the photoreceptor 15, the toner image on the photoreceptor 15 is transcribed. Next, the image is fixed by a fixing unit 17, and the transcription paper is ejected by an ejecting unit 18 outside a machine.

[0014]

When images are generated on both sides of the transcription paper, the transcription paper, which is fed from the first paper feeding tray 8, the second paper feeding tray 9, or the third paper feeding tray 10, and is image-generated, is not led to an ejecting tray 104 side, but is temporarily stocked in a both side paper feeding unit 111 by setting a turning nail 112 for switching a path in a upper side.

[0015]

Next, the transcription paper stocked in the both side paper feeding tray 111 is fed again from the both side paper feeding tray 111 to transcribe again a toner image generated in the photoreceptor 15, and is led to the paper ejecting tray 104 by setting the turning nail 112 for switching a path in an down side. When images are generated in both sides of the transcription paper, the both side paper feeding tray 111 is used as described above.

[0016]

A main motor 25 drives the photoreceptor 15, the carrying belt 16, the fixing unit 17, the paper ejecting unit 18, and the developing unit 27, and each of paper feeding apparatuses 11 to 13 is driven by a driving force of the main motor 25, the driving force being transferred by each of paper feeding clutches 22 to 24. The vertical carrying unit 14 is driven by the

driving force of the main motor, the driving force being transferred by an intermediate clutch 21.

[0017]

Figure 2 illustrates a rough diagram of the operation unit 30. The operation unit 30 mainly includes a liquid crystal touch panel 31, ten keys 32, a clear/stop key 33, a print key 34, and a mode clear key 35, and the liquid crystal touch panel 31 displays a function key 37, the number of copies, and a message indicating a status of the image forming apparatus, and the like.

[0018]

Figure 3 illustrates an exemplary display of the liquid crystal touch panel 31 of the operation unit 30. When an operator touches a key displayed on the liquid crystal touch panel 31, a color of the key indicating a selected function turns to black. When it is necessary to designate details of the functions (e.g. scaling value for scaling), a screen for setting a detailed function is displayed by touching the key. As described above, since a dot display is used for the liquid crystal touch panel, the liquid crystal touch panel can graphically display a display which is optimal at that time.

[0019]

Figure 4 illustrates an arrangement of a controlling apparatus including a main controller 20 as

a center. The main controller 20 controls the whole image forming apparatus. The main controller 20 connects to a distributed controlling apparatus such as the operation unit 30 for displaying to the operator, and controlling a function setting input from the operator, an image processing unit (IPU) 49 for controlling a scanner, controlling to write a document image in an image memory, and controlling to generating an image from the image memory, and an automatic document feeder (ADF) 1.

[0020]

Each distributed controlling apparatus and the main controller 20 communicate a status of a machine and an operation instruction according as needed. The main controller 20 also connects to the main motor 25, and a variety of clutches 21 to 24 which are necessary to carry paper, and the like.

[0021]

Here, with reference to Figure. 1, such an operation will be described that an image is read, and a latent image of an image is formed on a recording surface. Noted that the latent image is an electrical potential distribution induced by converting the image to optical information to illuminate the optical information on a photoreceptor surface.

[0022]

The reading unit 50 comprises the contact glass 6 on which a document is placed and an optical scanning system, and the optical scanning system mainly comprises an exposure lamp 51, a first mirror 52, a lens 53, a CCD image sensor 54, and the like.

[0023]

The exposure lamp 51 and the first mirror 52 are fixed on a first carriage (not illustrated), and a second mirror 55 and a third mirror 56 are fixed on a second carriage (not illustrated). When a document image is read, the first carriage and the second carriage are mechanically scanned at a relative rate of two to one so that an optical path length is not changed. This optical scanning system is driven by a scanner driving motor (not illustrated).

[0024]

The document image is read by the CCD image sensor 54, and to be converted to an electrical signal to be processed. By moving the lens 53 and the CCD image sensor 54 in a horizontal direction in the Figure 1, the image magnification can be changed. That is, the lens 53 and the CCD image sensor 54 are moved corresponding to the designated magnification in the horizontal direction, and is placed at a prescribed position.

[0025]

The writing unit 57 comprises a laser outputting unit 58, an imaging lens 59, and a mirror 60, and in the laser outputting unit 58, a laser diode which is a laser optical source and a polygonal mirror which is rotated at a high and constant rate by a motor are provided. The laser light illuminated from the laser outputting unit 58 is polarized by the polygonal mirror rotating at a constant rate, passes through the imaging lens 59, is reflected by the mirror 60, and is focused and imaged on the photoreceptor surface.

[0026]

The polarized laser light is exposure-scanned in a direction (main scanning direction) which is orthogonalized to a direction in which the photoreceptor rotates, and records each line of an image signal outputted from a selector 64 of an after-mentioned image processing unit. By repeating the main scanning at a rotating rate of the photoreceptor and in a prescribed period corresponding to a recording density, an image (electrostatic latent image) is formed on a photoreceptor surface.

[0027]

As described above, the laser light outputted from the writing unit 57 is illuminated to the photoreceptor 15 of an image generating system. A beam sensor generating a main scan synchronizing signal is installed at a position, to which a laser beam is

illuminated, around one side of the photoreceptor 15 (not illustrated). A controlling signal is generated, the controlling signal controlling an image recording start timing of the main scanning direction, and inputting and outputting an after-mentioned image signal based on this main scan synchronizing signal.

[0028]

Figure 5 illustrates an arrangement of the image processing unit (IPU) 49. The light illuminated from the exposure lamp 51 illuminates a document surface, and the reflected light from the document surface is imaged and is received by an imaging lens (not illustrated) to be photo-electrically converted in the CCD image sensor 54, and is converted to a digital signal by an A/D converter 61. After being processed by a shading correction 62, the image signal converted to the digital signal is processed with an MTF correction, a □ correction, and the like in an image processing unit 63.

[0029]

The selector 64 switches a destination of the image signal to a scaling unit 71 or to an image memory controller 65. The image signal passing through the scaling unit 71 is expanded or reduced according to a scaling magnification, and is transferred to the writing unit 57. The image memory controller 65 and the selector 64 each has an arrangement capable of bi-

directionally inputting and outputting the image signal to/from each other.

[0030]

The image processing unit (IPU) includes a function for selecting input and output of a plurality of pieces of data so that the image data (e.g. data outputted from a data processing apparatus such as a personal computer) delivered from outside can be also processed other than the image data inputted from the reading unit 50.

[0031]

The image processing unit (IPU) 49 comprises a CPU 68 for setting to the image memory controller 65 and the like, and for controlling the reading unit 50 and the writing unit 57, and a ROM 69 and a RAM 70 for saving a program and data of the CPU 68. The CPU 68 can also write and read data of an image memory 66 through the memory controller 65.

[0032]

Figure 6 illustrates a detailed arrangement of the memory controller 65, and a relational diagram of the memory controller 65 and the image memory 66.

[0033]

The memory controller 65 mainly includes an input data selector 101, an image synthesizer 102, a primary compression/expansion 103, an output data selector 104, and secondary compression/expansion 105. Control data

is set to each block by the CPU 68. The address and data illustrated in Figure 5 indicate the image data, and the address and data connected to the CPU 68 are not illustrated.

[0034]

The image memory 66 comprises a primary storing apparatus 106 and a secondary storing apparatus 107. A high-rate accessible memory such as a DRAM is used for the primary storing apparatus 106 so that it is possible to write data to a designated area of a memory, or read data from a designated area of a memory when an image is outputted as roughly synchronized with a data transfer rate required when the image data is inputted/outputted.

[0035]

The primary storing apparatus 106 also has an arrangement (an interface unit with a memory controller) so that the image data is divided to a plurality of areas according to the size of the image data to be processed and is inputted and outputted at the same time.

[0036]

The secondary storing apparatus 107 is a large-capacity memory for saving data to synthesize and sort an inputted image. If the primary storing apparatus 106 includes an enough capacity to process the image

data, data is not inputted and outputted to the secondary storing apparatus 107.

[0037]

If the secondary storing apparatus 107 can write/read data as roughly synchronized with a data transfer rate required when an image is inputted and outputted, it is also possible to directly write or read the image data to be inputted or outputted to or from the secondary storing apparatus 107. Data can be processed without distinguishing the primary and the secondary.

[0038]

When the secondary storing apparatus 107 can not write/read data as roughly synchronized with the data transfer rate required when an image is inputted and outputted, for example, even if a storing medium such as a hard disk and a magnet-optical disk is used for the secondary storing apparatus 107, by inputting and outputting data to the secondary storing apparatus 107 via the primary storing apparatus 106, the image memory 66 has an arrangement capable of processing according to a data transfer capability of the secondary storing apparatus 107.

[0039]

With the above arrangement, such a method can be adopted that a storing element can be selected according to an image data processing rate of the image

forming apparatus, and a compression ratio and a expansion ratio are different according to data (a data access rate to a memory is different according to a data type). If the compression ratio and the expansion ratio are variable, a capacity of the storing apparatus may be saved. In the present embodiment, a hard disk drive unit is used as the large-capacity secondary storing apparatus.

[0040]

Next, an exemplary operation of the memory controller 65 will be described. Here, it will be described an example of a case where the secondary storing apparatus 107 can not write/read data as roughly synchronized with the data transfer rate required when an image is inputted and outputted.

[0041]

[Input an image (save to an image memory)] First, an exemplary operation for inputting an image (save to an image memory) will be described. The input data selector 101 selects the image data to be written to the image memory (the primary storing apparatus 106) from a plurality of pieces of data. The image data selected by the input data selector 101 is delivered to the image synthesizer 102, and is synthesized with data which has been already saved in the image memory.

[0042]

The image data processed by the image synthesizer 102 is compressed by the primary compression/expansion 103, and the compressed data is written in the primary storing apparatus 106. After being further compressed by the secondary compression/expansion 105 as needed, the data written in the primary storing apparatus 106 is saved in the hard disk (HDD) 107.

[0043]

[Output an image (read from an image memory)] Next, an exemplary operation for outputting an image (read from an image memory) will be described. When an image is outputted, the image data stored in the primary storing apparatus 106 is read. When the image to be outputted is saved in the primary storing apparatus 106, the image data of the primary storing apparatus 106 is expanded by the primary compression/expansion 103, and the expanded data, or data obtained by synthesizing images of the expanded data and the input data is selected by an output data selector 104 to be outputted.

[0044]

The image synthesizer 102 synthesizes the data of the primary storing apparatus 106 and the input data (including a function for adjusting a phase of the image data), and selects an output destination of the synthesized data (outputting an image, writing back data to the primary storing apparatus 106, and data can be outputted to both output destinations at the same

time), and the like. When an image to be outputted is not saved in the primary storing apparatus 106, after the image data to be outputted, the image data being saved in the HDD 107, is expanded by the secondary compression/expansion 105, and the expanded data is written in the primary storing apparatus 106, the above image outputting operation is executed.

[0045]

A printing unit 74 generating print image data is connected to a CPU bus, and generates a character image for printing a page, an image for an arbitrary stamp, and the like. The image data generated by this printing unit 74 is inputted to a print synthesizing 1 apparatus 72 and a print synthesizing 2 apparatus 73, and an arbitrary image can be synthesized to the document image, and an image from a memory.

[0046]

Particularly, an arbitrary image for a stamp is configured so that a user can register as needed. In a stamp image registering mode, an image from a scanner is previously registered in the above HDD, and if the user selects a necessary stamp image, this stamp image data is read from the HDD, and is transferred to the print synthesizing apparatuses 72 and 73 to be synthesized to the document image.

[0047]

Figure 7 illustrates an area structure of a hard disk. The hard disk has mainly three areas , which are a management data area, a document image data area, and a stamp image data area. Position information of a defective block induced in the hard disk is recorded in the management data area, the plurality of pieces of document image data in an electronic sort mode are recorded in the document image data area, and user stamp image data registered by the user is recorded in the stamp image data area.

[0048]

While a minimum assignment unit of the hard disk is normally a sector of 512 bytes, if the assignment is managed in a too small unit, the necessary management information is increased, so that the assignment may be frequently managed in a unit of a block obtained by collecting a plurality of sectors. In the present embodiment, the storing area with 64 KB/block is assigned to the document image data, and the storing area with one KB/block is assigned to the stamp image data.

[0049]

The following is because the block size is not fixed. The size of the document image data is a few MB per one document even if being compressed, on the other hand, the size of the user stamp image is one KB per one stamp, and the data sizes are widely different from

each other, so that if the block size is fixed, the storing area can not be efficiently utilized. 512 MB of 64 KB x 8192 (2000H) block is provided for the document image data area, and 160 KB of 16 KB x 10 block is provided for the stamp image area.

[0050]

Generally, the hard disk includes a defective sector in which data can not be normally read and written due to a small defect on the recording medium. While this defect is induced in a production process of the recording medium, when the hard disk is being used, this defect may be also induced if a strong impact is added from outside. In the present embodiment, when at least one defective sector exists in a block, the block is registered as a defective block, thereby, in a normal copying operation, the image data is not written in such a defective block.

[0051]

In a network file server, and the like, such a hot-fix operation is realized that it is confirmed whether or not data is normally written by verifying after data is written, and if an error is induced, the area is registered as a defective sector, and at the same time, data to be written is written again in another sector. However, in a copying machine, it is not allowed to degrade the copying productivity when an access error is induced in the hard disk, so that when

the copying machine is shipped from a factory, and in a free time such as while the copying machine is being waiting for a new copying, it is checking whether or not the defective sector exists.

[0052]

Figure 7 illustrates such an aspect that the document image data and the stamp image data are saved in the hard disk as avoiding the defective block. One bit of flag is provided for each block in a defective block management area, and if a defective block is detected, a location of the defective block is managed by setting the bit corresponding to the block number.

[0053]

In the copying, since it is necessary to frequently access defective block management data, if the hard disk is accessed every time the data is required, the copying productivity may be degraded. Thus, when an electric power of a machine is turned on, the defective block management data is read onto a memory, and when the normal copying is executed, the copy on this memory is referred. When the defective block is registered, the management data on the memory is updated, and at the same time, the management data is also written on the hard disk, thereby, the identity of the defective block management data is maintained.

[0054]

After being compressed with a variable length, the document image data is saved in the hard disk, so that the size of the document image data is changed according to the compression ratio. So that, a sheet of document image data is divided to an unfixed number of blocks to be recorded. Thus, in the present embodiment, as illustrated in Figure 8, a directory table and a block allocation table are constructed on the memory to manage the block number corresponding to each document.

[0055]

The directory table includes entries for a maximum number of sheets of documents, and each entry corresponds to a sheet of document. Each entry holds the first block number of a group of a plurality of blocks in which the document image data is divided and recorded. The block allocation table includes entries for total number of blocks in the hard disk, and each entry corresponds to one block. Each entry holds next block number in which the image data is sequentially recorded from the corresponding block.

[0056]

However, when the block is the last block included in a sheet of document image data, FFFFH is held as an end mark. Thus, by referring to both of the directory table and the block allocation table, a chain of a

series of block numbers corresponding to a sheet of document image can be obtained.

[0057]

Only information of the block in which the defective sector exists is recorded in the hard disk, and the directory table and the block allocation table which indicate whether or not each block is being used are stored on the memory. Thus, for example, when a power is turned off, and the memory is initialized while the image information is being stored, only the defective block information is normally remained, and the image information automatically becomes not to be stored.

[0058]

Figure 10 illustrates an operation flow when it is checked whether or not the defective sector exists in the hard disk. The existence of the defective sector is sequentially checked from the block 0, and if the defective sector is detected, the block number is registered in the defective block management area.

[0059]

While there are some methods for checking the defective sector, in the present embodiment, a read command for the previous sector included in the block is issued to the hard disk, and it is decided according to the termination status returned from the hard disk whether or not the sector is the defective sector.

[0060]

Normally, in the hard disk side, since an error correction and an error retry process are automatically executed, even if a read error is induced, if the read error is recovered by the error correction or the error retry, the main box can not obtain any information. Thus, when the defective sector is checked, the error correction and the error retry are restricted in the hard disk side, thereby, the defective sector can be securely detected.

[0061]

As described above, in the present embodiment, while the defective sector is detected only by the reading process, such a procedure can be considered as a method for increasing a defective sector detection ratio that a prescribed data pattern is written and, it is confirmed whether or not the prescribed data pattern can be normally read.

[0062]

[Advantages of the Invention]

As apparent from the above description, according to the image forming apparatus of the present invention, the image memory 66 includes the primary storing apparatus 106 and the secondary storing apparatus 107, and the image information and the management information of the storing apparatus can be separately saved, so that when the storing apparatus is accessed,

only the image information can be sequentially accessed without accessing the management information on the storing apparatus, so that the storing apparatus can be efficiently accessed, and the productivity of the image forming can be prevented from being degraded.

[0063]

In the management information of the storing apparatus, the defective block information such as the defective sector and the normal information are separated, and only the necessarily minimum management information can be stored in the storing apparatus, so that the amount of access to the storing apparatus can be reduced, and the productivity of the image forming can be prevented from being degraded.

[Brief Description of the Drawings]

[Figure 1]

Figure 1 is the whole arrangement diagram illustrating an embodiment of an image forming apparatus of the present invention.

[Figure 2]

Figure 2 is an arrangement diagram of an operation unit 30 of an embodiment of Figure 1.

[Figure 3]

Figure 3 is an exemplary display of the operation unit 30 of the embodiment of Figure 1.

[Figure 4]

Figure 4 is an arrangement diagram of a controlling apparatus of the embodiment of Figure 1.

[Figure 5]

Figure 5 is an arrangement diagram of an image processing unit 49 of the embodiment of Figure 1.

[Figure 6]

Figure 6 is a detailed arrangement diagram of a main controller 65 of Figure 5.

[Figure 7]

Figure 7 is a diagram illustrating an area structure of a hard disk.

[Figure 8]

Figure 8 is a diagram illustrating an exemplary structure of a directory table.

[Figure 9]

Figure 9 is a diagram illustrating an exemplary structure of a block allocation table.

[Figure 10]

Figure 10 is a flow diagram of a defective sector checking process.

[Description of Symbols]

20 main controller

49 image processing unit

50 reading unit

57 writing unit

65 image memory control

66 image memory

68 CPU

106 primary storing apparatus

107 secondary storing apparatus

Figure 8

#1 DIRECTORY TABLE

Figure 2

□□□□□

Figure 3

#1 AUTOMATIC DENSITY

#2 AUTOMATIC PAPER SELECT

#3 SCALING

#4 PAGE PRINT

#5 DARK

#6 A4 SIDEWISE

#7 SORT

#8 BOTH SURFACE

#9 LIGHT

#10 A4 VERTICAL

#11 A3 VERTICAL

#12 STAPLE

#13 COLLECT

Figure 4

7 DOCUMENT SET DETECTOR

20 MAIN CONTROLLER

21 INTERMEDIATE CLUTCH

22 FIRST PAPER FEEDING CLUTCH

23 SECOND PAPER FEEDING CLUTCH

24 THIRD PAPER FEEDING CLUTCH

25 MAIN MOTOR

26 TRANSFERRING MOTOR

30 OPERATION UNIT

120 HUMAN BODY SENSOR

121 KEY CARD

#1 IMAGE MEMORY

#2 SCANNER

Figure 6

56 IMAGE MEMORY

65 MEMORY CONTROLLER

101 INPUT DATA SELECTOR

102 IMAGE SYNTHESIZER

103 PRIMARY COMPRESSION/EXPANSION

104 OUTPUT DATA SELECTOR

105 SECONDARY COMPRESSION/EXPANSION

106 PRIMARY STORING APPARATUS

#1 DATA

Figure 5

#1 FROM CPU

#2 ADDRESS

#3 DATA

74 PRINT IMAGE DATA GENERATING APPARATUS (PRINT UNIT)

61 A/D CONVERTER

62 SHADING CORRECTION

63 MTF □ CORRECTION

72 PRINT SYNTHESIZER 1

64 SELECTOR

73 PRINT SYNTHESIZER 2

71 SCALING

57 WRITING UNIT

65 MEMORY CONTROLLER

66 IMAGE MEMORY

67 I/O PORT

#4 ADDRESS

#5 DATA

Figure 9

#1 BLOCK ALLOCATION TABLE

Figure 10

#1 DEFECTIVE SECTOR CHECKING PROCESS

#2 BLOCK NUMBER <- 0

#3 IS BLOCK DEFECT-MARKED

#4 READ ONE BLOCK

#5 IS READ ERROR INDUCED

#6 ATTACH DEFECT MARK TO BLOCK

#7 INCREMENT BLOCK NUMBER

#8 EXCEEDING OVER FINAL BLOCK NUMBER

Figure 7

#1 HARD DISK

#2 MANAGEMENT DATA AREA

#3 DOCUMENT IMAGE DATA AREA

#4 STAMP IMAGE DATA AREA

#5 DOCUMENT IMAGE DATA AREA

#6 DOCUMENT IMAGE - 1

#7 DOCUMENT IMAGE - 2

#8 DOCUMENT IMAGE - 3

#9 DOCUMENT IMAGE - 4

#10 STAMP IMAGE DATA AREA

#11 STAMP IMAGE 1

#12 STAMP IMAGE 2

#13 STAMP IMAGE 3

#14 STAMP IMAGE 4

#15 STAMP IMAGE 5

#16 STAMP IMAGE 6

#17 STAMP IMAGE 7

#18 STAMP IMAGE 8

#19 MANAGEMENT DATA AREA

#20 DEFECTIVE BLOCK MANAGEMENT AREA - 1

#21 DEFECTIVE BLOCK MANAGEMENT AREA - 2

#22 DEFECTIVE BLOCK MANAGEMENT AREA - 1

#23 DEFECTIVE BLOCK MANAGEMENT AREA - 2